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Contribution to the knowledge of the Neuroptera of the Oriental region of Morocco

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Abstract. Captures of Neuroptera were performed in the Oriental region of Morocco, carried out mainly in August using a light trap to inventory the neuropterous insects of the region. During this survey, we recorded 38 species of Myrmeleontidae, four species of Ascalaphidae, three species of Chrysopidae, and one species of Mantispidae, of Hemerobiidae and of Nemopteridae, respectively.

Introduction

In Morocco, the Emirate Centre for Wildlife Propagation (ECWP) designs and implements an overall conservation strategy aiming to restore and preserve the native populations of the Houbara Bustard, *Chlamydotis undulata* (Jacquin, 1784), of North Africa. To achieve this goal, the ECWP has implemented multi-disciplinary research in areas varied as physiology, nutrition, veterinary medicine and ecology in the Oriental (north-eastern) region of Morocco where the bustard's populations are found. The Oriental region is delimited to the East by the border with Algeria, to the West by the Middle Atlas and to the South by the High Atlas (Fig. 1). It consists of a high plateau located at an average altitude of 1 000 to 1 200 m above sea level [a.s.l.]. Temperatures can fall to between -4°C and -9°C in winter (January–February), and rise to 44°C in summer (July–August). The annual rainfall is about 160 mm with a peak drought in July and especially August.

At the ECWP located close to the town of Missour, an investigation project has been in place for several years to determine precisely the diet of the Houbara Bustard, which is known to be omnivorous and feed on plants, small vertebrates such as lizards and invertebrates. Regarding insects, several surveys were performed to know better the entomological fauna of the Oriental region in order to determine the species preyed on by the bustard. The purpose of the survey of Neuroptera was to complete the data that had earlier focussed on other insect groups such as Coleoptera: Tenebrionidae, Hymenoptera: Formicidae or Orthoptera found in this region of Morocco.

The first list of the Neuroptera of Morocco was published by Monserrat et al. (1990). Subsequently, several authors provided additional information (Aspöck & Aspöck 2009; Aspöck et al. 2001; Badano & Pantaleoni 2012; Faucheux et al. 2012; Michel

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2013, 2014; Pantaleoni et al. 2012) and recently Abraham (2017) published an updated inventory of Myrmeleontiformia including descriptions of new species. Currently, 29 species of Coniopterygidae, one species of Sisyridae, two species of Mantispidae, three species of Berothidae, nine species of Hemerobiidae, 33 species of Chrysopidae, seven species of Nemopteridae, 66 species of Myrmeleontidae and 12 species of Ascalaphidae have been recorded in Morocco (Annex 1).

Material and methods

The survey was performed during two collecting missions carried out during the month of August. The first mission (15–22.viii.2012) took place in the south of the region and the second mission (03–12.viii.2015) followed a south-north transect from Missour to the north region and the Moulouya River delta. Independently of these two missions, the second author (AF) carried out additional prospectings between April and October.

Neuroptera collections were mainly performed during the night using a light trap. Additional prospection and captures were carried out during the day, in particular in the search for larval stages. The larvae collected were reared at the laboratory of entomology of the ECWP.

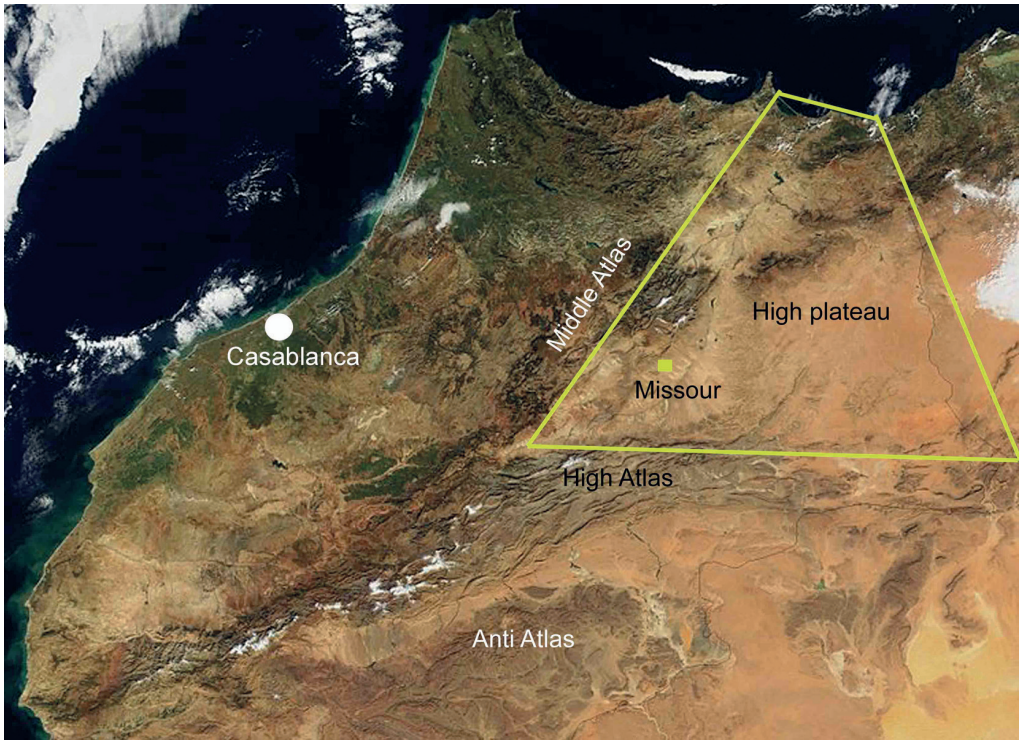

Figure 1. Delimitation of the Oriental region of Morocco. Satellite image: https://commons.wikimedia.org/wiki/File:Satellite_image_of_Morocco_in_January_2002.jpg; (Jacques Descloitres, MODIS Land Rapid Response Team, NASA/GSFC [Public domain])

During the two missions in August, a total of 16 localities were surveyed covering a wide diversity of biotopes such as the hyper-arid areas of the southern part of the Oriental region, ungrazed meadow at the ECWP or sub-humid and humid zones in the valley and the delta of the Moulouya River.

Results

The list below includes all the species collected during the missions in August and the additional records taken by the second author (AF).

1 – Myrmeleontidae

Palparini: *Palpares angustus* McLachlan, 1898, *P. hispanus* Hagen, 1860.

Dendroleontini: *Bankisus antiatlasiensis* Abraham, 2009.

Nemoleontini: *Creoleon* cf. *aegyptiacus* (Rambur, 1842), *C.* cf. *griseus* (Klug, 1834), *C. lugdunensis* (Villers, 1789), *Creoleon* spp. (6 unidentified species), *Delfimeus scriptus* Navás, 1912, *Delfimeus* sp., *Distoleon annulatus* (Klug, 1834), *D. divisus* (Navás, 1913), *Macronemurus appendiculatus* (Latreille, 1807), *M. elegantulus* McLachlan, 1898, *M. gallus* Hölzel, 1987, *Macronemurus* sp., *Mesonemurus harterti* Navás, 1919, *Neuroleon* cf. *leptaleus* (Navás, 1912), *N.* cf. *danieli* (Lacroix, 1922), *Neuroleon tenellus* (Klug, 1834), *Pseudoformicaleo gracilis* (Klug, 1834).

Myrmeleontini: *Myrmeleon fasciatus* (Navás, 1912), *M. gerlindae* Hölzel, 1974, *M. hyalinus* Olivier, 1811.

Nesoleontini: *Cueta lineosa* (Rambur, 1842).

Myrmecaelurini: *Gepus invisus* Navás, 1912, *Myrmecaelurus lachlani* Navás, 1912, *M. lepidus* (Klug, 1834), *Myrmecaelurus* spp. (2 unidentified species), *Nophis teillardi* Navás, 1912, *Solter liber* Navás, 1912, *S. francoisi* Michel, 2014, *S. leopardalis* Michel, 2014.

A total of 38 species of Myrmeleontidae were collected in the Oriental region. The most abundant species, represented by at least 20 specimens, were *Cueta lineosa* (83 specimens), *Distoleon annulatus* (59 specimens), *Neuroleon tenellus* (50 specimens), *Solter liber* (35 specimens), *Creoleon* cf. *aegyptiacus* (24 specimens) and *C. griseus* (20 specimens).

2 – Ascalaphidae, Ascalaphinae

Ascalaphus barbarus (Linnée, 1767), *Deleproctophylla blusei* Kimmins, 1949, *Libelloides ictericus* (Charpentier, 1825), *Puer algericus* van der Weele, 1908.

All the species are uncommon catches. *Ascalaphus barbarus* was collected in the humid environment of the Moulouya valley whereas the other species were collected in arid or hyper-arid areas.

3 – Chrysopidae

Chrysopinae: *Italochrysa stigmatica* (Rambur, 1842), *Suarius walsinghami* Navás, 1914, *Chrysoperla lucasina* (Lacroix, 1912).

The most abundant species was *S. walsinghami*, sometimes represented by very abundant population. The two other species collected during the prospectings were scarce.

4 – Hemerobiidae

Wesmaelius sp., one male.

5 – Mantispidae

Mantispa aphavexelte Aspöck & Aspöck, 1994. A single female collected at light.

6 – Nemopteridae

One unidentified species of Crocinae. Adults were obtained from larvae collected in rocky cavities with very fine sand on the ground.

Conclusion

A total of 49 species of Neuroptera were collected in the Oriental region of Morocco, of which 38 belong to Myrmeleontidae and four to Ascalaphidae, representing respectively 58 % and 33 %of the species known from Morocco. Considering the other families, the ratio (number of species collected during the prospecting/number of species recorded in Morocco) is as follows: Chrysopidae 3/12, Mantispidae 1/2, Hemerobiidae 1/9 and Nemopteridae 1/7. These results indicate that the Oriental region, although located at high elevation and subject to harsh winters and very arid summers, harbours a rich and diverse Neuroptera fauna.

In August, most of the Neuroptera species collected with a light trap in the Oriental region of Morocco were Myrmeleontidae, representing 84 % of all the species found.

The study of the material collected showed that several genera are in need of revision, particularly *Creoleon*, *Myrmecaelurus* and *Neuroleon*. Regarding the Myrmecaelurini, the survey yielded two new species belonging to the genus *Solter* (Michel 2014).

Bankisus antiatlasensis was known only from the type locality in the Anti-Atlas at 1 533 m a.s.l. The capture of this species at Missour greatly extends its area of distribution to the north and shows that it is also present at lower altitude.

Gymnocnemia editaerevayae Michel, 2013, described from Oukaimeden, a locality in the High Atlas Mountains at around 2 500 m a.s.l. (Michel 2013), was collected again in August south-east of Midelt at 1 960 m a.s.l., close to the southern limit of the Oriental region. Unlike the previous species, it seems that *G. editaerevayae* lives at high elevations and does not reach the Oriental region.

The list of Neuroptera of the Oriental region of Morocco presented here is not likely to be exhaustive and intensive surveys during other periods of the year can be expected to provide new records.

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Annex 1

List of Neuroptera recorded from Morocco, excluding Myrmeleontiformia listed by Abraham (2017).

Coniopterygidae: Aleuropteryginae
- *Aleuropteryx iberica* Monserrat, 1977
- *Aleuropteryx juniperi* Ohm, 1968
- *Aleuropteryx maculata* Meinander, 1963
- *Aleuropteryx minuta* Meinander, 1965
- *Aleuropteryx wawrikae* Rausch & Aspöck, 1978
- *Helicoconis hispanica* Ohm, 1965
- *Helicoconis maroccana* (Carpentier & Lestage, 1928)
- *Helicoconis pseudolutea* Ohm, 1965

Coniopterygidae: Coniopteryginae
- *Coniopteryx arcuata* Kis, 1965
- *Coniopteryx atlantica* Ohm, 1983
- *Coniopteryx atlasensis* Meinander, 1963
- *Coniopteryx borealis* Tjeder, 1930
- *Coniopteryx drammonti* Rousset, 1964
- *Coniopteryx haematica* McLachlan, 1868
- *Coniopteryx mucrogonarcuata* Meinander, 1979
- *Coniopteryx perisi* Monserrat, 1976
- *Coniopteryx pygmaea* Enderlein, 1906

Coniopteryx tjederi Kimmins, 1934
Conwentzia pineticola Enderlein, 1905
Conwentzia psociformis (Curtis, 1834)
Hemisemidalis pallida (Withycombe, 1924)
Nimboa espanoli Ohm, 1973
Nimboa marroquina Monserrat, 1985
Parasemidalis fusca Meinander, 1963
Semidalis aleyrodiformis (Stephens, 1836)
Semidalis candida Navás, 1916
Semidalis pluriramosa (Karny, 1924)
Semidalis pseudouncinata Meinander, 1963
Semidalis vicina (Hagen, 1861)
Sisyridae
Sisyra iridipennis (Costa, 1884)
Mantispidae: Mantispinae
Mantispa aphavexelte (Aspöck & Aspöck, 1994)
Mantispa styriaca (Poda, 1761)
Berothidae: Berothinae
Isoscelipteron glaserellum (Aspöck, Aspöck & Hölzel, 1979)
Nodalla eatoni (McLachlan, 1898)
Nodalla saharica (Esben-Petersen, 1920)
Hemerobiidae: Hemerobiinae
Hemerobius stigma Stephens, 1836
Wesmaelius lindbergi (Esben-Petersen, 1931)
Wesmaelius navasi (Andréu, 1911)
Wesmaelius subnebulosus (Stephens, 1836)
Hemerobiidae: Sympherobiinae
Sympherobius pygmaeus (Rambur, 1842)
Sympherobius fallax Navás, 1908
Hemerobiidae: Megalomiinae
Megalomus atomarius Navás, 1935
Megalomus tineoides Rambur, 1842
Hemerobiidae: Microminae
Micromus angulatus (Stephens, 1836)
Chrysopidae: Chrysopinae
Brinckochrysa chlorosoma (Navás, 1914)
Chrysopa formosa Brauer, 1850
Chrysopa mimeuri Navás, 1935
Chrysopa nigricostata Brauer, 1850
Chrysopa pallens (Rambur, 1838)
Chrysopa punctata (Navás, 1935)
Chrysopa viridana Schneider, 1845
Chrysoperla carnea (Stephens, 1836)
Chrysoperla lucasina (Lacroix, 1912)
Chrysoperla mediterranea (Hölzel, 1972)
Chrysoperla mutata (McLachlan, 1898)
Cunctochrysa baetica (Hölzel, 1972)
Italochrysa stigmatica (Rambur, 1842)
Nineta guadarramensis (Pictet, 1865)
Peyerimhoffina gracilis (Schneider, 1851)
Pseudomallada alarconis (Navás, 1915)
Pseudomallada flavifrons (Brauer, 1850)
Pseudomallada genei (Rambur, 1842)
Pseudomallada granadensis (Pictet, 1865)
Pseudomallada ifraninus (Navás, 1935)
Pseudomallada irrorellus (Navás, 1935)
Pseudomallada maghrebinus (Hölzel & Ohm, 1984)
Pseudomallada picteti (McLachlan, 1880)
Pseudomallada prasinus (Burmeister, 1839)
Pseudomallada subcubitalis (Navás, 1901)
Pseudomallada venosus (Rambur, 1842)
Pseudomallada viridifrons (Hölzel & Ohm, 1999)
Rexa lordina Navás, 1919
Suarius caviceps (McLachlan, 1898)
Suarius maroccanus Hölzel, 1965
Suarius tigridis (Morton, 1926)
Suarius walsinghami Navás, 1914